

4 Affected Environment

This chapter of the environmental assessment (EA) describes the human, physical, and natural environmental conditions that could be affected by the Proposed Action. Specifically, the EA considers effects on the environmental resource categories identified in Appendix A of Federal Aviation Administration (FAA) Order 1050.1E, Chg. 1, *Environmental Impacts: Policies and Procedures* (FAA Order 1050.1E). The potential environmental impacts of the Proposed Action and No Action Alternatives are discussed in Chapter 5, *Environmental Consequences*.

The technical terms and concepts discussed in this chapter are explained in Chapter 1, *Background*.

4.1 General Study Area

To describe existing conditions in the North Texas Metroplex, the FAA developed a General Study Area (GSA). The GSA is used to evaluate the potential for environmental impacts that might occur as a result of implementation of the Proposed Action. Two overall objectives guided the development of the GSA:

1. The GSA was designed to capture all flight paths identified for the No Action Alternative using 2011 radar data (the latest year of complete data available at the time the EA process began) and the flight paths designed as part of the Proposed Action up to the point at which 95 percent of departing aircraft are above 10,000 ft. AGL and 95 percent of arriving aircraft are above 7,000 ft. AGL. Paragraph 14.5e of Appendix A to FAA Order 1050.1E, requires consideration of impacts of airspace actions from the surface to 10,000 ft. AGL if the GSA is larger than the immediate area around an airport or involves more than one airport. Furthermore, policy guidance issued by the FAA Program Director for Air Traffic Airspace Management states that for air traffic project environmental analyses, noise impacts should be evaluated for proposed changes in arrival procedures between 3,000 and 7,000 ft. AGL and departure procedures between 3,000 and 10,000 ft. AGL for large civil jet aircraft weighing over 75,000 pounds.³⁸
2. The lateral extent of the GSA was concisely defined to focus on areas of air traffic flow. Please see section 4.1.2 for further discussion.

The following sections describe the data acquired and methodology used to develop the GSA.

4.1.1 Data Acquisition to Develop the General Study Area

The size of the GSA is based on aircraft arrivals and departures at the Study Airports. **Table 4-1** lists operations by Study Airport and the type of operation. An operation is defined as a takeoff or landing by an aircraft.

³⁸ Department of Transportation, Federal Aviation Administration, *Memorandum Regarding Altitude Cut-Off for National Airspace Redesign (NAR) Environmental Analyses*, September 15, 2003.

Table 4-1 Airport Operations by Airport and Category

Airport Code	Air Carrier	Air Taxi	General Aviation	Military	Total
DFW	467,912	172,629	6,074	188	646,803
DAL	87,063	29,351	61,677	1107	179,198
FTW	114	10,751	79,812	449	91,126
ADS	7,686	4,077	88,990	18726	119,479
AFW	40	7,664	67,466	749	75,919
NFW	4	756	147,115	156	148,031
TKI	1	1,328	81,557	52	82,938
GKY	18	556	74,521	102	75,197
DTO	0	426	57,375	319	58,120
RBD	0	147	54,826	222	55,195
FWS	118	0	253	27,836	28,207
Total Operations	562,956	227,685	719,666	49,906	1,560,213

Source: FAA ATADS (2011);
Prepared By: Harris Miller Miller & Hanson Inc., October 2012

Aircraft flight altitudes were identified for both the Proposed Action and No Action Alternative using radar data for 2011, the latest full year of data available at the time the analysis was conducted. However, only 281 days of data was used for 2011. The remaining 84 days of data for 2011 was either unavailable due to radar equipment anomalies, operational outages, or extreme weather events that made the data unreliable. The radar data was used to understand existing arrival and departure flight paths for aircraft operating under IFR conditions in the North Texas Metroplex. The initial area was analyzed and subsequently outlined to a size that was based on a detailed analysis of radar data and topography. The analysis of radar data included an assessment of existing flight tracks and profiles (altitudes) as well as consideration of proposed flight tracks and profiles. The need to capture 95 percent of departing aircraft operating within 10,000 ft. of the ground combined with the varied topography was used to set the altitude limit of the GSA. United States Geological Survey (USGS) data were acquired to define ground elevations throughout the GSA.

The radar data analysis included an assessment of existing and proposed flight tracks and profiles (altitudes)³⁹. The radar data obtained to determine the GSA and existing noise conditions is further discussed in Section 4.3.1.

³⁹ Proposed Action tracks were based on the Terminal Area Route Generations, Evaluation, and Traffic Simulation (TARGETS) design package (June 6, 2012) provided by the FAA Design and Implementation Team.

4.1.2 Methodologies Used to Determine the General Study Area

As discussed in Section 4.1, the parameters for defining the GSA are based on the requirements of FAA Order 1050.1E (Appendix A, Paragraph 14.5e) and policy guidance issued by the Program Director for Air Traffic Airspace Management for air traffic project environmental analyses. Accordingly, the GSA is a three-dimensional block of airspace designed to capture aircraft operations to and from the Study Airports as they operate at or below 10,000 ft. AGL. The lateral dimensions of the GSA were defined using 2011 radar data to determine the point at which departing aircraft penetrate the 10,000 ft. AGL altitude and arriving aircraft penetrate the 7,000 ft. AGL altitude. Applying these criteria, the GSA captures the maximum range of flight tracks where 95 percent of aircraft pass through 10,000 ft. AGL ceiling. The outer boundaries of the GSA are largely shaped by the 7,000 ft. AGL point data⁴⁰ for arrivals because the aircraft are travelling at this altitude further away from the Study Airports compared to departures, which reach higher altitudes closer in. However, the GSA boundary was also shaped by the 10,000 ft. AGL points in areas over which departure operations predominate.

Because the GSA represents an area between the ground surface up to 10,000 ft. AGL, it was necessary to identify ground elevations throughout the North Texas Metroplex area. Data from the USGS was used to ensure the best representation of terrain conditions below the aircraft flight paths. Areas with high concentrations of air traffic flows were used to focus the GSA boundaries and to eliminate areas from the GSA with minimal or no aircraft overflights. Similarly, because the surface elevations can sometimes vary throughout the GSA, the top elevation of the GSA was established at 10,000 ft. AGL above the highest point of elevation on the ground for areas predominately overflowed by departures.

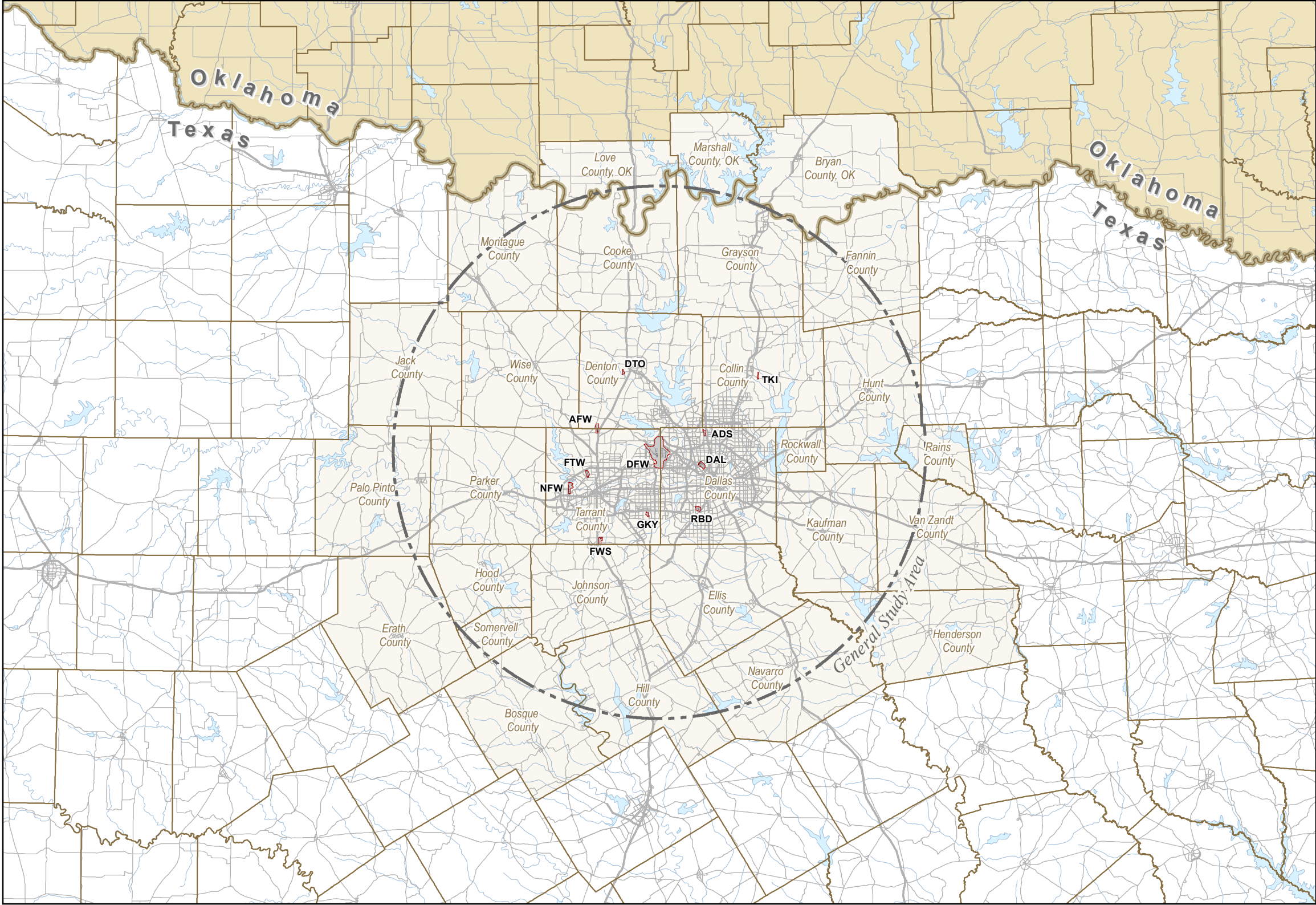
The resulting GSA consists of the area within a 60 nautical mile (NM) radius of DFW for evaluating potential impacts of proposed changes in aircraft routings below 10,000 ft. AGL. The GSA includes all or part of 29 counties in Texas and Oklahoma (26 in Texas and 3 in Oklahoma). **Exhibit 4-1** depicts the GSA developed for this EA. **Table 4-2** identifies the two states and 29 counties in the GSA.

Table 4-2 States and Counties in the General Study Area

Texas				
Bosque	Collin	Cooke	Denton	Dallas
Ellis	Erath	Fannin	Grayson	Henderson
Hill	Hood	Hunt	Jack	Johnson
Kaufman	Montague	Navarro	Palo Pinto	Parker
Rains	Rockwall	Somervell	Tarrant	Van Zandt
Wise				
Oklahoma				
Bryan	Love	Marshall		

Source: Systems Research Institute, Inc. 2012; Environmental
Prepared by: Harris Miller Miller & Hanson Inc., September 2012

⁴⁰ Point data or points are used to define an area of interest in GIS.

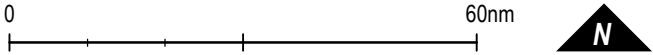


LEGEND

- General Study Area
- Study Airport Boundary
- Texas Counties
- Oklahoma Counties
- Counties within the Study Area
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
General Study Area Origin: Center of DFW (Longitude -97.037996, Latitude 32.896828), Radius: 60NMI

- ADS - Addison Airport
- AFW - Fort Worth Alliance Airport
- DAL - Dallas Love Field
- DFW - Dallas Fort Worth International Airport
- DTO - Denton Municipal Airport
- FTW - Fort Worth Meacham International Airport
- FWS - Fort Worth Spinks Airport
- GKY - Arlington Municipal Airport
- NFW - Fort Worth Naval Air Station
- RBD - Dallas Executive Airport
- TKI - Collin County Regional Airport at McKinney



Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, Roads, Airport Boundaries), May 03, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-1

General Study Area

4.2 Resource Categories or Sub-Categories Not Affected

This section discusses the environmental resource categories or sub-categories included in Appendix A of FAA Order 1050.1E that would remain unaffected by the Proposed Action. These resource categories would not be affected because the resource either does not exist within the GSA or the types of activities associated with the Proposed Action would not affect them. Accordingly, they are not carried forward in the EA for further detailed analysis. The resource categories or sub-categories are:

- **Coastal Resources:** The Proposed Action does not involve land acquisition or ground disturbing activities that would affect coastal resources.
- **Construction Impacts:** The Proposed Action does not involve any construction or ground disturbing activities.
- **Farmlands:** The Proposed Action would not involve land acquisition or ground disturbance that would have the potential to convert existing farmland to a non-agricultural use.
- **Fish, Wildlife and Plants:** Fish and Plants sub-categories are not affected under the proposed action: The Proposed Action is generally situated in areas above 3,000 ft. AGL and would not involve ground disturbance or other activities that would affect plant or fish. However, Wildlife (Bats and Avian) species are further discussed in section 3.4.5.
- **Floodplains:** The Proposed Action would not be situated in areas that include floodplains.
- **Hazardous Materials, Pollution Prevention, and Solid Waste:** The Proposed Action would not generate, disturb, transport, or treat hazardous materials.
- **Historic, Architectural, Archeological, and Cultural Resources:** Archeological and Architectural sub-categories are not affected under the proposed action: The Proposed Action would not involve land acquisition or ground disturbing activities that would affect archaeological or architectural resources. However, Historic and Cultural Resources are discussed further in section 4.3.4.
- **Light Emissions and Visual Impacts:** Light Emissions sub-category will not be affected by the proposed action: The Proposed Action does not involve construction of any structures that would introduce new sources of lighting. However, Visual Impacts are further discussed in section 4.3.10.
- **Natural Resources and Energy Supply:** Natural Resources sub-category will not be affected by the proposed action: The Proposed Action would not require use of unusual natural resources or other materials, or those in short supply. However, Energy Supply is further discussed in section 4.3.7.
- **Secondary (Induced) Impacts:** The Proposed Action would not cause changes in patterns of population movement or growth, public service demands, or business and economic activity. In addition, the Proposed Action does not involve construction or other ground disturbing activities that would involve the relocation of people or businesses. Furthermore, the proposed project does not include the construction of airport facilities that would result in or induce an increase in operational capacity.

- **Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks:**
 - Socioeconomic Impacts sub-category will not be affected by the proposed action: The Proposed Action would not involve acquisition of real estate, relocation of residents or community businesses, disruption of local traffic patterns, loss in community tax base, or changes to the fabric of the community.
 - Children's Environmental Health and Safety Risks sub-categories will not be affected by the proposed action: The Proposed Action would not involve products or substances, with which a child is likely to be exposed, come into contact, ingest, or use. Furthermore, the Proposed Action would not result in a local increase in emissions that would have the potential to affect children's health. Accordingly, there would be no increase in environmental health and safety risks that could disproportionately affect children.
 - Environmental Justice sub-category is further discussed in section 4.3.6
- **Water Quality:** The Proposed Action does not involve any ground disturbing activities that would result in an increase in impervious surfaces or affect water quality or ground water.
- **Wetlands:** The Proposed Action does not involve land acquisition or ground disturbing activities that would affect wetlands.
- **Wild and Scenic Rivers:** There are no designated Wild and Scenic Rivers located within the GSA.

4.3 Potentially Affected Resource Categories or Subcategories

This section provides information on the current conditions within the GSA for those environmental resource categories or sub-categories that the Proposed Action could potentially affect. The sections of the document where they are described in detail are noted in parentheses. They include:

- Noise (4.3.1)
- Compatible Land Use (4.3.2)
- Department of Transportation Act: Section 4(f) (4.3.3)
- Historical, Architectural, Archeological, and Cultural Resources – Historical and Cultural Resources sub-categories (4.3.4)
- Fish, Wildlife, and Plants (4.3.5)
- Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks – Environmental Justice sub-category (4.3.6)
- Energy Supply (aircraft fuel) (4.3.7)
- Air Quality (4.3.8)
- Greenhouse Gases and Climate Change (4.3.9)
- Light Emissions and Visual Impacts (4.3.10)

4.3.1 Noise

This section discusses guidance and regulations established by the FAA for noise analyses, noise model input development, and existing aircraft noise conditions. Existing conditions are based on year 2011 operations, the most recent full calendar year at the time this analysis was begun. **Appendix E** provides background information on the physics of sound, the effects of noise on people, and noise metrics. More detailed information related to the noise model input is available on the OAPM website at http://oapmenvironmental.com/ntx_metroplex/ntx_docs.html.

4.3.1.1 Noise Modeling Methodology

To comply with NEPA requirements, the FAA developed specific guidance and requirements for the assessment of aircraft noise. This guidance, specified in FAA Order 1050.1E, requires that aircraft noise be analyzed in terms of the yearly Day-Night Average Sound Level (DNL) metric. In practice, this requirement means that DNL is computed for an average annual day (AAD) of operations for the year of interest.

The DNL metric is a single value representing the aircraft sound level over a 24-hour period. DNL includes all of the time-varying sound energy within the period. To represent the greater annoyance caused by a noise event at night, the DNL metric includes a 10-decibel (dB) weighting for noise events occurring between 10:00 P.M. and 6:59 A.M. (nighttime). The nighttime event weighting helps to account for annoyance that would potentially be caused by noise during night time periods when ambient noise levels are lower. The weighting used equates one night flight to 10 day flights. In this EA, for ease of reference, the format DNL 45 is used to represent a noise exposure level of DNL 45 dB. Additional details relating to the DNL as the metric of choice by FAA are available in **Appendix E**.

In addition to requiring the use of the DNL metric, FAA also requires that aircraft noise be evaluated using one of several authorized computer noise models. FAA Order 1050.1E states that the Noise Integrated Routing System (NIRS) should be used for flight track changes over large areas and at altitudes over 3,000 AGL. Specifically, for the Proposed Action, 1050.1E specifies use of NIRS, Version 7.0b.

For this EA, the FAA conducted a detailed analysis of aircraft operating under IFR conditions in 2011. Although the noise environment around major airports comes almost entirely from jet aircraft operations, the DNL calculations reflect noise from many types of jet and propeller aircraft operations on IFR flight plans that could be affected by the Proposed Action. Most aircraft around major airports operate under IFR to obtain direction on separation from surrounding aircraft from air traffic control (ATC) in these busy areas. Those aircraft operating under Visual Flight Rules (VFR) are unaffected by the Proposed Action.

When operating outside certain categories of controlled airspace, the aircraft operating under VFR described above are not required to be in contact with ATC. Because these aircraft operate at the discretion of the pilot and are often not required to file flight plans, the FAA has very limited information for these operations. Subsequently, there is no known source for comprehensive route, altitude, aircraft type, and frequency information for these VFR operations in the GSA. However, even if complete information were available for VFR operations, the Proposed Action evaluated in the EA would not require any changes to routing or altitudes to accommodate these operations. If they could be modeled, they would use the same flight routes and altitudes under the Proposed Action and No Action

Alternative scenarios. Therefore, VFR aircraft were not included in the analysis. Their operations would not be affected by the forecast conditions in 2014 (the first year of implementation) and 2019 (five years after implementation) for both the No Action Alternative and Proposed Action.

NIRS requires a variety of inputs, including local environmental data (e.g., temperature and humidity), runway layout, aircraft operations, runway use, and flight tracks. Accordingly, detailed information on aircraft operations for the Study Airports was assembled for input into NIRS. This includes specific aircraft fleet mix information such as aircraft type, arrival and departure times, and origin/destination airport.

AAD NIRS Operations: A total of 649,792 IFR-filed flights from/to the Study Airports were identified through an examination of radar data obtained from the FAA's Performance Data Analysis and Reporting System (PDARS). The PDARS database was queried for the 2011 calendar year for all IFR-filed flights that operated at the study airports within the GSA. As described in Section 4.1.1, during this 365 day period, 84 days of data were unusable. The 281 days of usable data span all seasons and runway usage configurations for the Study Airports in the GSA. This data was used to develop the AAD fleet mix, time of day (day and night) and runway use input for NIRS. More detailed information related to the NIRS input for Existing Conditions is available upon request (Please see **Appendix C** for contact information).

AAD NIRS Flight Tracks and Climb/Descent Patterns: The PDARS data provided tracks for each flight that occurred within the 281 days of 2011. The data was not only used to define the AAD track locations and use representing a typical flow of traffic, but also the typical climb and descent patterns that occur along each flow. Patterns also include top-of-climb and top-of-descent locations for fuel burn modeling purposes. The tracks were analyzed using proprietary software in order to visualize and analyze the radar data. All the trajectories were "bundled" into a set of tracks representing a flow. The flows comprise all the typical flight routings within the GSA for an average annual day. NIRS tracks are then developed based on the group of radar tracks representing each flow.

The NIRS model was used to calculate noise levels for the following specific locations on the ground:

- **Census Block Centroids:** The NIRS model can be used to calculate DNL at the geographic centers (centroids) of census blocks to estimate the population exposed to varying levels of aircraft noise exposure. For this EA, population within the GSA was analyzed using 2010 U.S. Census block geometries.⁴¹ A census block is the smallest geographical unit used by the United States Census to collect data. The census block centroid DNL represents the DNL for the total maximum potential population within that census block. Because noise levels are analyzed only at the centroid point and applied to the entire census block area population and because the area represented by each centroid varies depending on the density of population, the actual noise exposure level for individuals will vary from the reported level based on their proximity to the geographic centroid.
- **Grid Points:** The NIRS model can also be used to calculate noise exposure at evenly spaced grid points. For this EA, the GSA was covered with a 0.5 nm by 0.5 nm grid.

⁴¹ US Census Bureau, *2010 Tracts and American Community Survey Selected Economic Characteristics*, 2010.

- **Unique Points:** Noise levels at sites of interest too small to be captured in the 0.5 nm grid can also be analyzed using the NIRS model. Such sites include individual Section 4(f) resources that are less than one square nautical mile in area (such as significant public parks), and historic sites (such as individual buildings). See Section 4.3.3 for a discussion of what constitutes a Section 4(f) resource and Section 4.3.4 for a discussion of historic properties in the GSA.

In total, noise exposure levels were calculated at 98,511 census block centroids (centroids in the GSA that represent areas with population). In addition, 28,490 uniformly spaced grid points were modeled within the GSA, and 527 additional and unique, site-specific points (505 Historic and 22 Section 4(f)) throughout the GSA.

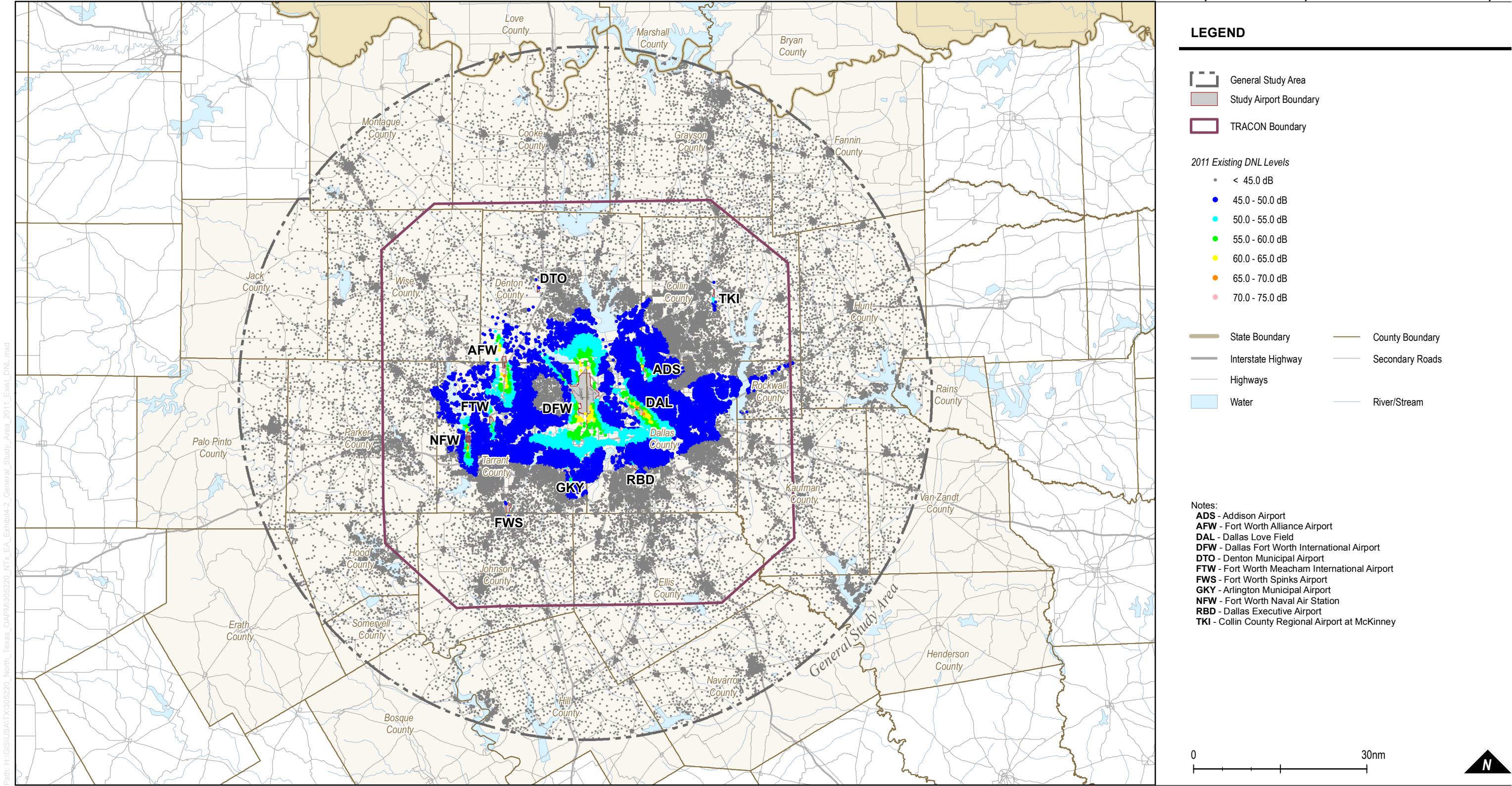
4.3.1.2 Existing Aircraft Noise Exposure

Table 4-3 describes the population exposed to AAD DNL in ranges between DNL 45dB and less, DNL45 and 50dB, DNL50 and 55dB, DNL55 and 60dB and DNL60dB and 65dB. This data is provided to establish a baseline for existing aircraft noise exposure represented by the DNL metric. The information provided refers to DNL only within the GSA. **Exhibit 4-2** provides a graphical representation of the 2011 existing condition DNL within the GSA.

Table 4-3 Existing Conditions – Estimated Population Exposed to Aircraft Noise within General study area (2011)

<u>DNL Range (dB)</u>	<u>Population</u>	<u>Percent of Total</u>	<u>Color</u>
Less than DNL 45	3220543	47.29%	Grey
DNL 45 to less than DNL 50	2662526	39.95%	Dark Blue
DNL 50 to less than DNL 55	614689	9.11%	Light Blue
DNL 55 to less than DNL 60	195674	2.85%	Dark Green
DNL 60 to less than DNL 65	49350	0.75%	Light Green
DNL 65 to less than DNL 70	2762	0.05%	Yellow
Total	6745544	100.00%	

Sources: NIRS Version 7.0b3; US Census Bureau, 2010 Census Redistricting Data (Public Law 94-171) Summary File
 Prepared by: Harris Miller Miller & Hanson Inc., September 2012



Data Source: MITRE (TRACON Boundary), August 22, 2012; National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, Roads, Airport Boundaries), May 03, 2012;
United States Census (Census Block Centroids), July 24, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-2

Existing (2011) Noise Exposure
Population Centroids

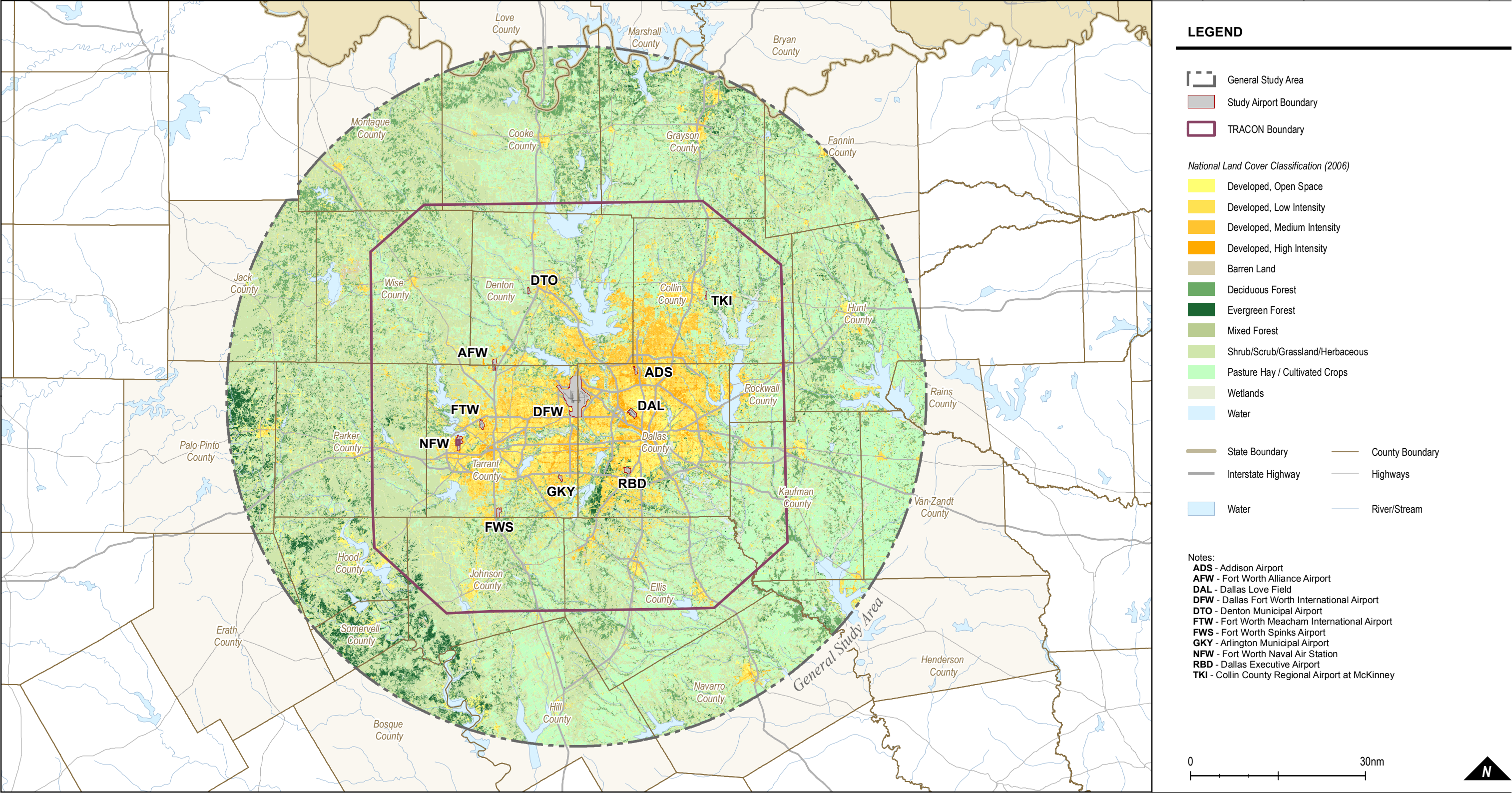
4.3.2 Compatible Land Use

Land coverage data was obtained from the USGS National Land Cover Database 2006 (NLCD 2006). Land coverage classifications located within the GSA include:

- **Open Water**—areas of open water, generally with less than 25 percent cover of vegetation or soil.
- **Developed, Open Space**—areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.
- **Developed, Low Intensity**— areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20 percent to 49 percent of total cover. These areas most commonly include single-family housing units.
- **Developed, Medium Intensity**— areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50 percent to 79 percent of the total cover. These areas most commonly include single-family housing units.
- **Developed, High Intensity**— highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 percent to 100 percent of the total cover.
- **Barren Land**— areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15 percent of total cover.
- **Deciduous Forest**—areas dominated by trees generally greater than five meters tall, and greater than 20 percent of total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to seasonal change.
- **Evergreen Forest**—areas dominated by trees generally greater than five meters tall, and greater than 20 percent of total vegetation cover. More than 75 percent of the tree species maintain their leaves all year. The canopy is never without green foliage.
- **Mixed Forest**— areas dominated by trees generally greater than five meters tall, and greater than 20 percent of total vegetation cover. Neither deciduous nor evergreen species are greater than 75 percent of total tree cover.
- **Shrub/Scrub**— areas dominated by shrubs; less than five meters tall with shrub canopy typically greater than 20 percent of total vegetation. This class includes true shrubs, young trees in an early successional stage, or trees stunted from environmental conditions.
- **Grasslands/Herbaceous**— areas dominated by graminoid or herbaceous vegetation, generally greater than 80 percent of total vegetation. These areas are not subject to intensive management such as tilling, but can be used for grazing.

- **Hay/Pasture**— areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of total vegetation.
- **Cultivated Crops**— areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20 percent of total vegetation. This class also includes all land being actively tilled.
- **Woody Wetlands**— areas where forest or shrub land vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
- **Emergent Herbaceous Wetlands**—Areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Exhibit 4-3 shows the distribution of land coverage types within the GSA. The GSA includes numerous large parks, recreational areas, wilderness areas, forests, and other types of resources managed by federal and state agencies. These resources are further discussed in Section 4.3.3.



Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; United States Geological Survey (National Land Cover Data, 2006), September 24, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-3

General Study Area Land Cover

4.3.3 Department of Transportation Act, Section 4(f) Resources

Section 4(f) of the DOT Act (codified at 49 U.S.C. § 303(c)), states that, subject to exceptions for *de minimis* impacts:

“... the Secretary may approve a transportation program or project (other than any project for a park road or parkway under section 204 of title) requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of an historic site of national, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, area, refuge, or site) only if —

- (1) there is no prudent and feasible alternative to using that land; and
- (2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use.”

The term “use” includes both physical and indirect or “constructive” impacts to Section 4(f) properties. Direct use is the physical occupation or alteration (direct use) of a Section 4(f) property or any portion of a Section 4(f) property. A “constructive” use does not require direct physical impacts or occupation of a Section 4(f) resource. A constructive use would occur when an action would result in substantial impairment of a resource to the degree that the activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished. The determination of use must consider the entire property and not simply the portion of the property being used for a proposed project.

Special consideration is given to parks and natural areas where a quiet setting is a generally recognized purpose and attribute. In these areas the FAA official “...must consult all appropriate Federal, State, and local officials having jurisdiction over the affected Section 4(f) resources when determining whether project-related noise impacts would substantially impair the resource.”

Since there is the potential for the Proposed Action to constructively “use” Section 4(f) properties due to noise effects, this section describes the 4(f) resources located within the GSA. **Table 4-4** identifies the categories of Section 4(f) properties considered in identifying these resources within the GSA, as well as the agencies responsible for managing them. Privately-owned parks, recreation areas, and wildlife refuges are not subject to the Section 4(f) provisions.

Table 4-4 Types of Section 4(f) Resources Considered in the General Study Area (1 of 2)

Section 4(f) Property Type	Responsible Agency/Agencies
Historic Sites (Only those listed on the National Register of Historic Places & National Registry of Natural Landmarks)	National Park Service, State and Local Agencies
National Forests and Grasslands	U.S. Forest Service
National Historical Park, National Historic Site, and International Historic Site	National Park Service
National Lakeshore	National Park Service

National Memorial	National Park Service
National Natural Landmarks	National Park Service
National Historic Landmarks	National Park Service
National Military Park, National Battlefield Park, National Battlefield Site, and National Battlefield	National Park Service

Table 4-4 Types of Section 4(f) Resources Considered in the General Study Area (2 of 2)

Section 4(f) Property Type	Responsible Agency/Agencies
National Monument	National Park Service, Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service
National Park	National Park Service
National Parkway	National Park Service
National Preserve and National Reserve	National Park Service
National Recreation Area	National Park Service, Bureau of Land Management, U.S. Forest Service
National River and National Wild and Scenic River and Riverway	National Park Service, Bureau of Land Management
National Scenic Trail	National Park Service, Bureau of Land Management
National Seashore	National Park Service
National Wilderness Areas	Bureau of Land Management
Nationally-Recognized Trails	National Park Service
Other Designations (White House, National Mall, etc.)	National Park Service
Significant Regional Parks and Trails	State Agencies
State Parks and Forests	State Agencies
State Wilderness Areas	State Agencies
Local Parks and Recreational Facilities	Local Agencies

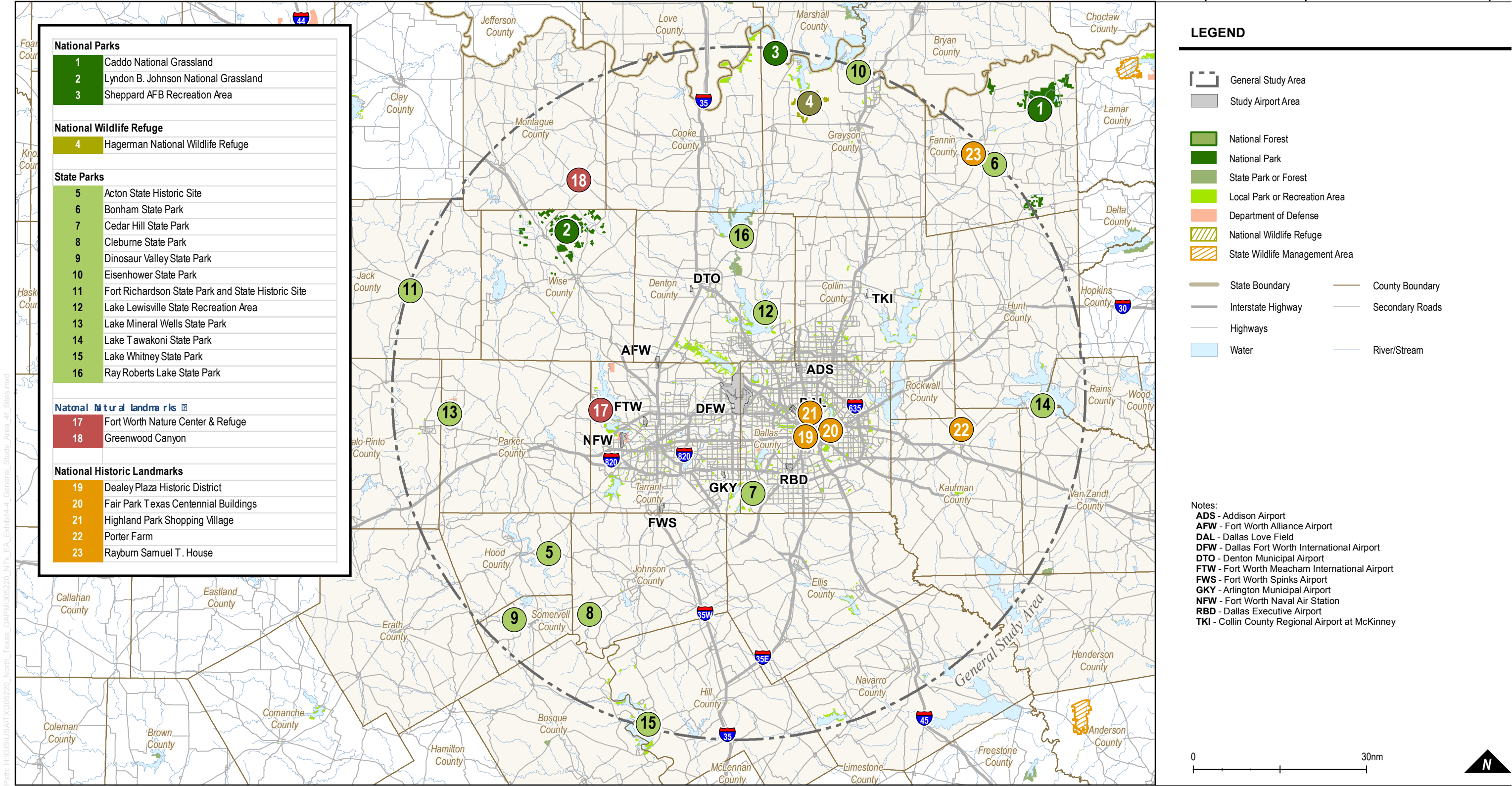
Sources: National Park Service, 2013 National Park System Inventory, March 28, 2013; Bureau of Land Management, National Conservation Lands (http://www.blm.gov/wo/st/en/prog/blm_special_areas/NLCS.html); U.S. Fish and Wildlife Service, Marine National Monuments (<http://www.fws.gov/marinenationalmonuments/>); U.S. Forest Service, Recreational Resources (<http://www.fs.fed.us/recreation/>).

Prepared by: Harris Miller Miller & Hanson Inc., August 2013

Many Section 4(f) properties are also subject to the Section 6(f) of the Land and Water Conservation Fund Act of 1965 (LWCF) (16 U.S.C. § 460I–4 *et seq.*). Section 6(f) states that no public outdoor recreation areas acquired or developed with any LWCF assistance can be converted to non-recreation uses without the approval of the Secretary of the Interior. The Secretary of the Interior may only approve conversions if they are in accordance with the comprehensive statewide outdoor recreation plan and if the converted areas will be replaced with other recreation lands of reasonably equivalent usefulness and location.

4.3.3.1 Potential Section 4(f) Resources in the General Study Area

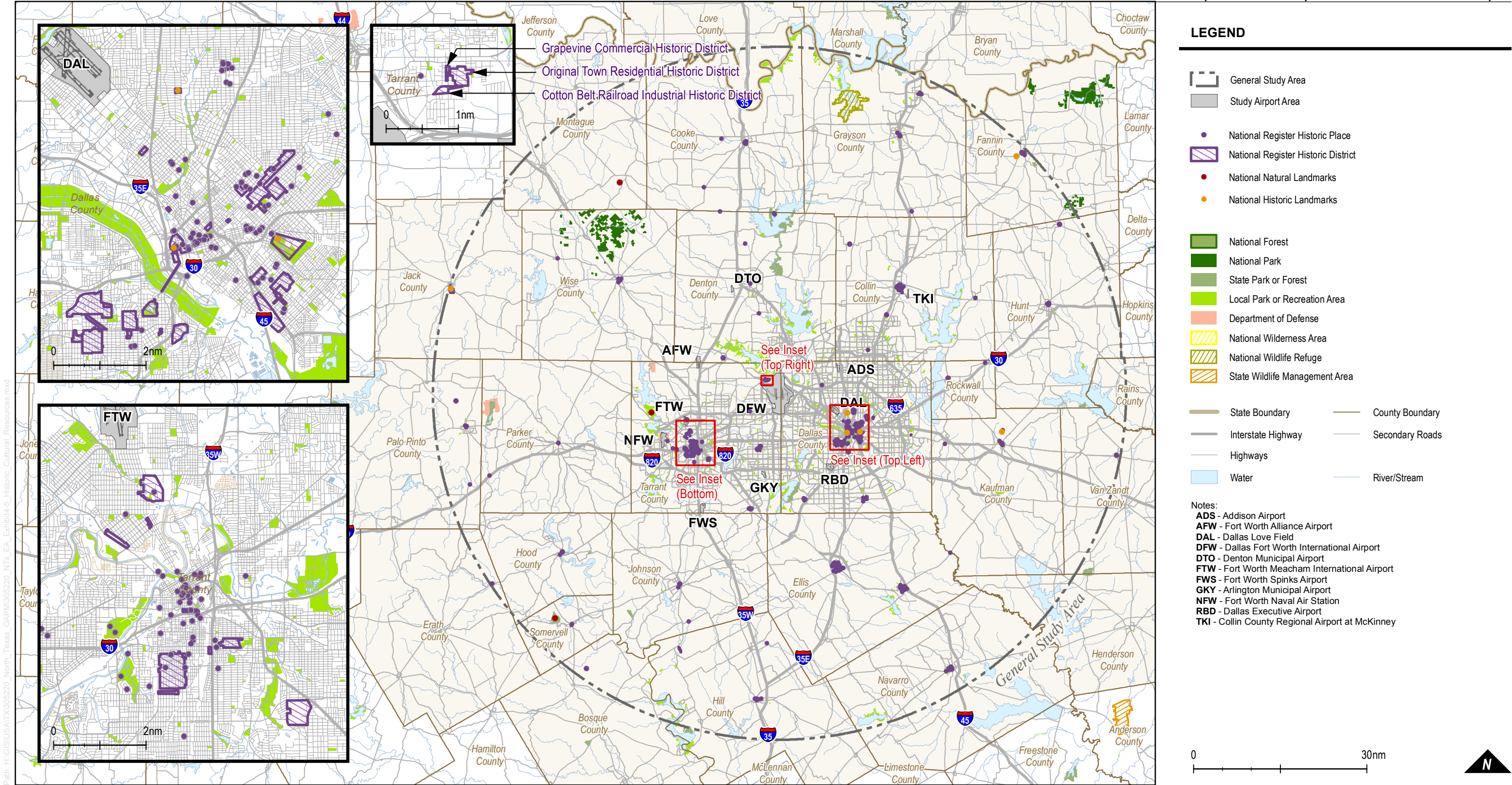
Data collected from both federal and state sources was used to identify Section 4(f) resources located within the GSA. A total of 1,220 Section 4(f) resources were identified within the GSA. **Exhibit 4-4** depicts the locations of all potential Section 4(f) resources within the GSA, excluding historic and cultural resources. The locations of historic and cultural resources, discussed in Section 4.3.4, are depicted on **Exhibit 4-5**. **Appendix F** includes a list of the Section 4(f) resources identified in the GSA, the type of resource (i.e., federal, state, or local), the state and county in which they are located, site acreage, and DNL under existing conditions.



Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; National Atlas (Wilderness Areas), February 08, 2012; Texas Natural Resource Information System (TNRIS) (Wildlife Management Areas), February 08, 2012; US Fish & Wildlife Service (National Wildlife Refuge), June 13, 2012; United States Dept. of Agriculture (National Forest), May 07, 2012; National Park Service (National Park), February 07, 2012; TNRIS (State Parks or Forest/Local Parks), May 03, 2012; TNRIS (Department of Defense), February 08, 2012; Environmental Systems Research Institute, Inc. (Local Parks (ESRI)), May 03, 2012; Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-4

General Study Area 4(f) Sites



Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; National Atlas (Wilderness Areas), February 08, 2012; Texas Natural Resource Information System (TNRIS) (Wildlife Management Areas), February 08, 2012; US Fish & Wildlife Service (National Wildlife Refuge), June 13, 2012; United States Dept. of Agriculture (National Forest), May 07, 2012; National Park Service (National Park), February 07, 2012; TNRIS (State Parks or Forest/Local Parks), May 03, 2012; TNRIS (Department of Defense), February 08, 2012; Environmental Systems Research Institute, Inc. (Local Parks (ESRI)), May 03, 2012; National Park Service (National Register of Historic Places/Districts), July 3, 2012; Texas Historical Commission (Historic Properties), March 7, 2012; Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-5

General Study Area Historical and
Cultural Resources

4.3.4 Historical, Architectural, Archeological, and Cultural Resources– Historic, Archeological and Cultural Resources Sub-Categories

The National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. § 470, as amended) requires federal agencies to consider the effects of their undertakings on properties listed or eligible for listing in the National Register of Historic Places (NRHP). Compliance requires consultation if there is a potential adverse effect to historic properties on or eligible for listing on the NRHP. If required, such consultation would occur with the Advisory Council on Historic Preservation, State Historic Preservation Officers (SHPO), and/or the Tribal Historic Preservation Officers (THPO). Additionally, the Historic Sites Act of 1935 (Public Law 74-292) (16 U.S.C. 461 *et seq.*) was also used to augment the analysis specifically as it relates to NHLs and NNLs within the study area.

It is possible that changes in aircraft flight routes could introduce or increase aircraft routing over historic resources. This could result in potential adverse aircraft noise or visual impacts, depending on the setting of the property and how it is used. Therefore, historic properties in the GSA have been identified for this EA. For the purpose of this EA, historic properties are defined as resources that are listed or eligible for listing in the NRHP or relevant SHPO listings, or that have been identified through tribal consultation for values other than their archaeological qualities. As noted in Section 4.2, the Proposed Action does not involve ground disturbance that could potentially impact archaeological resources. Thus, archaeological resources are not further discussed in this EA.

4.3.4.1 Historic and Cultural Resources in the General study area

Exhibit 4-5 shows the location of historic and cultural resources identified in the GSA. A total of 515 properties (506 NRHP listed properties, 3 National Natural Landmark (NNL) properties and 6 National Historic Landmark (NHL) properties) were identified within Texas and none in Oklahoma. **Appendix G** includes a list of the historic and cultural resources identified in the GSA, the state and county in which they are located, and DNL under existing conditions.

4.3.5 Fish, Wildlife, and Plants

This section discusses the existing wildlife resources within the GSA. The Proposed Action involves redesign of the airspace (specifically the standard instrument arrival and departure procedures primarily above 3,000 ft. AGL and the supporting airspace management structure) serving the Study Airports. Accordingly, the discussion is limited to avian and bat species that may be present within the GSA.

Threatened and Endangered Species and Migratory Birds

The Endangered Species Act (ESA) of 1973, (16 U.S.C. § 1531 *et seq.* (1973)), requires the evaluation of all federal actions to determine whether a Proposed Action is likely to jeopardize any proposed, threatened, or endangered species or proposed or designated critical habitat. A federal action is one conducted, funded, or permitted by a federal agency. Section 7 of the ESA requires the lead federal agency (in this case the FAA) to consult with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) Fisheries to determine whether the proposed federal action would jeopardize the continued existence of any species listed or proposed for listing as

threatened or endangered; or result in the destruction or adverse modification of designated or proposed critical habitat. Critical habitat includes areas that will contribute to the recovery or survival of a listed species. Federal agencies are responsible for determining if an action “may affect” listed species. If so, the federal agency is required to prepare a Biological Assessment (BA) to determine if the action is “likely to adversely affect the species.” The potential for federal and state listed avian and bat species was assessed based on agency lists and reports. Data from the USFWS were used to identify potential federally-listed species.

Furthermore, the Texas legislature enacted legislation in 1973 to protect endangered animal populations in the state.⁴² The legislation authorized the Executive Director of the Texas Parks and Wildlife Department (TPWD) to name as endangered species being threatened with statewide extinction, and the TPWD Commission to name as threatened species those determined to become endangered in the future. The TPWD maintains a list of species receiving federal and state protection on its website and references the NatureServe Explorer⁴³ database for specific information.

Migratory Birds

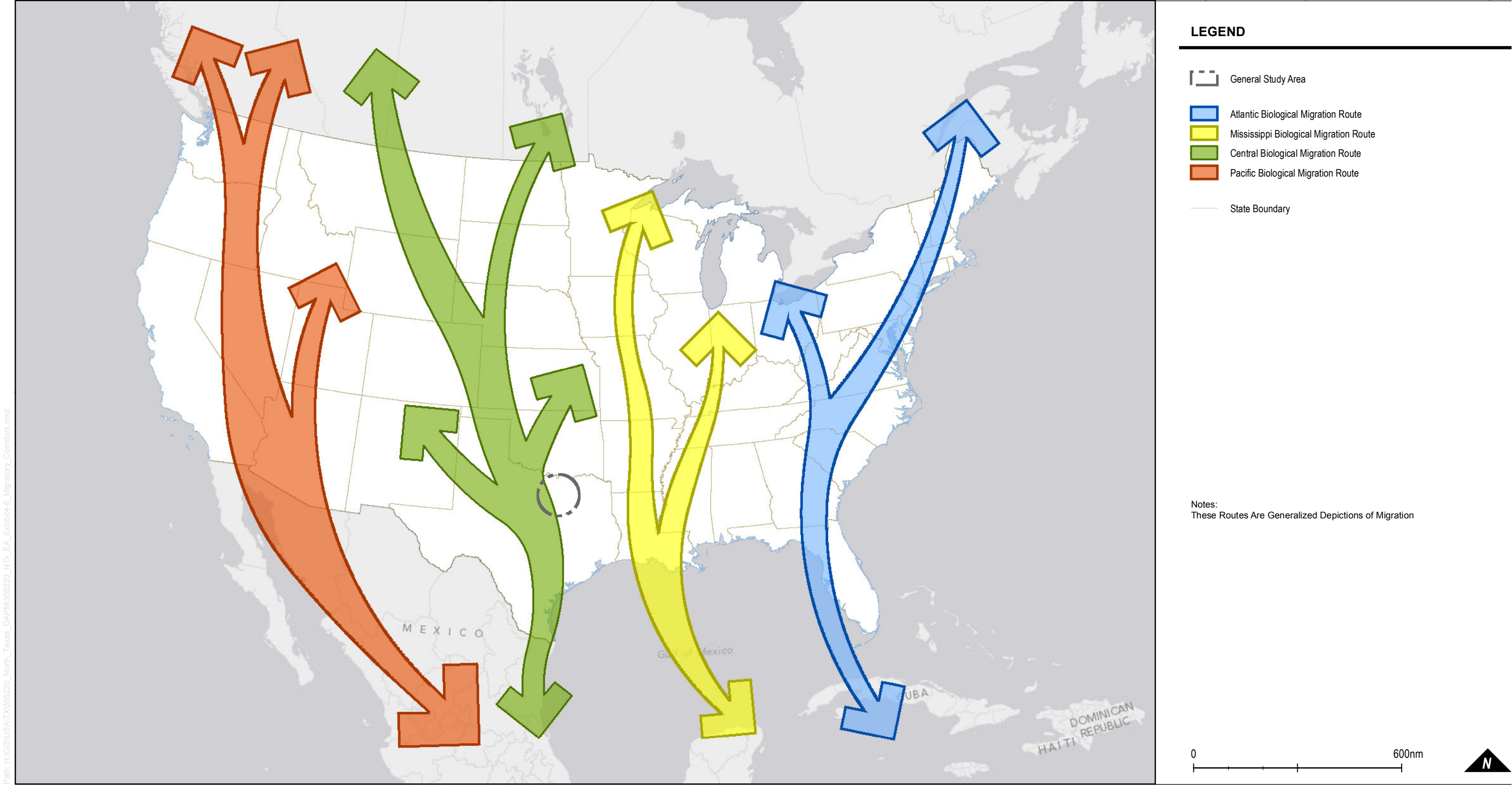
The Migratory Bird Treaty Act of 1918 (MBTA) prohibits, without permit issued by the USFWS, the taking of any migratory bird and any part, nest, or egg of any such bird. Take under the MBTA is defined as the action or attempt to “pursue, hunt, shoot, capture, collect, or kill.” Migratory birds listed under the ESA are managed by the agency staff members who handle compliance with Section 7 of ESA; management of all other migratory birds is overseen by the Migratory Bird Division of ESA. Numerous migratory birds occur in, or migrate through, the GSA.

Migration routes may be defined as the various lanes birds travel from their breeding ground to their winter quarters. The actual routes followed by a given migratory bird species differ by variables such as distance traveled, time of starting, flight speed, geographic position and latitude of the breeding, and wintering grounds.

Birds migrate along four main routes or flyways in North America: the Atlantic, the Central, the Mississippi, and the Pacific flyways, which are loosely delineated in these geographic regions and are depicted in **Exhibit 4-6**. These flyways are not specific lanes the birds follow but broad areas through which the birds migrate. The most frequently traveled migration routes conform very closely to major topographical features that lie in the general north-south movement of migratory bird flyways. Therefore, the lanes of heavier concentration in the GSA follow principal river valleys and mountain ranges.

⁴² http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/txendangered/ [accessed September 19, 2012]

⁴³ <http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Buteo+nitidus> [accessed September 19, 2012]



Path: H:\GIS\USAITX\305220_North_Texas_OAPM\305220_NTx_EA_Exhibit4-6_Migratory_Corridors.mxd

Data Source: Environmental Systems Research Institute, Inc. (State/County Boundaries, Roads, Airport Boundaries), May 03, 2012; Ducks Unlimited (Migratory Bird Corridors), September 24, 2012
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-6

Migratory Bird Corridors

Exhibit 4-6 also specifies the USFWS Migratory Bird Flyway Management Program administrative districts. The USFWS utilizes a number of different species lists for the management and protection of migratory birds and those programs are implemented through the Regional Flyway Districts. One central focus of migratory bird management is administering waterfowl hunting programs and monitoring their harvests in accordance with bird conservation laws.

The GSA is located within the Central Biological Migration Route, commonly referred to as the Central Flyway as depicted in **Exhibit 4-6**. The Central Flyway primarily includes the central-western section of the country from Texas and New Mexico in the south up to Montana and Idaho in the north. The Central Flyway includes two to three primary migration routes and is largely distinct from the other three major flyways within the continental U.S.

Avian and bat species of concern for the GSA are shown in **Table 4-5**.

Table 4-5 Threatened or Endangered Avian Species Potentially in the General Study Area

Status			Species	Type
FEDERAL	TX	OK		
	T		Bald Eagle (<i>Haliaeetus leucocephalus</i>)	Avian
E	E		Black-capped Vireo (<i>Vireo atricapilla</i>)	Avian
E	E		Golden-cheeked warbler (<i>Dendroica chrysoparia</i>)	Avian
E	E		Least tern (<i>Sterna antillarum</i>) – interior population	Avian
E,T	T		Piping plover (<i>Charadrius melodus</i>)	Avian
E, EXPN	E		Whooping crane (<i>Grus Americana</i>)	Avian

Legend: T – Threatened; E – Endangered;

Note: Bats were also considered but there are no bats species listed as threatened or endangered under Federal or State laws in the general study area

Sources: US Fish and Wildlife Service, <http://www.fws.gov/endangered/> Accessed September 12 2012., Texas Wildlife and Parks Department http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/, Accessed September 19 2012, Oklahoma Wildlife Department, <http://www.wildlifedepartment.com/wildlifemgmt/endangeredspecies.htm>, Accessed September 19, 2012.

Prepared by: Harris Miller Miller & Hanson Inc., September 2012

Existing Wildlife Strikes

Media attention to wildlife strikes with aircraft has increased over time. For example, there was substantial media coverage of the emergency forced landing of US Airways Flight 1549 in the Hudson River on January 15, 2009. This emergency landing was due to Canada geese being ingested into both of the aircraft's engines and demonstrates to the public that wildlife strikes are a serious but manageable aviation safety issue. The civil and military aviation communities have long recognized that the threat of aircraft collisions with wildlife is real and increasing. Globally, wildlife strikes have killed more than 229 people and destroyed over 210 aircraft since 1988. Factors that contribute to this threat are an increase in the populations of large birds as well as an increase in air traffic operations by quieter, turbofan-powered aircraft.

Table 4-6 provides a summary of wildlife and avian/bat strikes nationwide between 1990 and 2010. The number of strikes reported annually has increased more than five-fold from the 1,793 strikes in 1990 to 9,622 in 2010 (109,107 for 1990-2010). Prior to the emergency landing of US Airways Flight 1549, there was an average of 20 reported wildlife strikes per

landing of US Airways Flight 1549, there was an average of 20 reported wildlife strikes per day between 2004 and 2008. This increased to an average of 26 reported strikes per day in 2009; a 25-percent increase from 2008. This trend continued through 2010. Birds were involved in 97.2 percent of the strikes, terrestrial mammals in 2.3 percent, bats in 0.4 percent, and reptiles in 0.1 percent. Although the number of reported strikes has steadily increased, the number of reported damaging strikes has actually declined from 765 in 2000 to 573 in 2010

Table 4-6 1990-2011 National Wildlife and Avian/Bat Strike Summary

Year	Strikes		
	Avian/Bat	Other Wildlife	Total
1990	1,741	52	1,793
1991	2,255	54	2,309
1992	2,353	74	2,427
1993	2,409	67	2,476
1994	2,468	83	2,551
1995	2,679	92	2,771
1996	2,848	94	2,942
1997	3,351	109	3,460
1998	3,656	118	3,774
1999	5,007	97	5,104
2000	5,879	127	6,006
2001	5,644	146	5,790
2002	6,065	134	6,199
2003	5,869	132	6,001
2004	6,428	134	6,562
2005	7,103	139	7,242
2006	7,085	153	7,238
2007	7,569	183	7,752
2008	7,416	189	7,605
2009	9,239	244	9,483
2010	9,363	259	9,622
2011	9,869	214	10,083
Total	117,402	2,894	120,296

Sources: Wildlife Strikes to Civil Aircraft in the United States, 1990–2011, Serial Report Number 18, US Department of Transportation, Federal Aviation Administration, 2012
Prepared by: Harris Miller Miller & Hanson Inc., September 2012

The FAA National Wildlife Strike Database states that for commercial and GA aircraft, 72 and 76 percent of bird strikes, respectively, occurred at or below 500 ft. AGL.⁴⁴ Above 500 ft. AGL, the number of strikes declined by 33 percent for each 1,000-foot gain in height for commercial aircraft, and by 41 percent for GA aircraft.⁴⁵

⁴⁴ Id.

⁴⁵ Id.

The FAA National Wildlife Strike Database⁴⁶ was accessed to obtain wildlife strike reports for each study airport. A total of 4,488 strikes have been reported from the 22 airports in the GSA between 1993 and June 30, 2012. For 2011, 458 strikes were reported which included 454 birds, 1 bat, and 3 other. The GSA airports combined to report 4.5% of the 2011 national wildlife strike total and 4.6% of the avian/bat 2011 national strike total. A summary of the individual study airport data is reported in **Table 4-7**.

Table 4-7 General study area Airports Wildlife and Avian/Bat Strike Summary 2011

Airport*	Strikes		
	Avian/Bat	Other Wildlife	Total
Addison (ADS)	3	0	3
Arlington (GKY)	1	0	1
Cleburne (CPT)	0	0	0
Collin County (TKI)	7	0	7
Dallas Executive (RBD)	0	0	0
Dallas Love (DAL)	53	0	53
Dallas-Ft Worth (DFW)	362	2	364
Denton (DTO)	0	0	0
Fort Worth Alliance (AFW)	9	0	9
Fort Worth Spinks (FWS)	5	0	5
Fort Worth Meacham (FTW)	16	1	17
Lancaster Regional (LNC)	0	0	0
Mesquite Metro (HQZ)	0	0	0
NAS JRB Ft Worth (NFW)	0	0	0
Total	456	3	459

* The following airports in the general study area have not reported any wildlife strikes between 1990 and 2012: Bourland (50F), Decatur (LUD), Ennis (F41), Grand Prairie (GPM), Kenneth Copeland (4T2), Mid-way (JWY), Parker (WEA), and Rockwall (F46).

Source: US Department of Transportation, Federal Aviation Administration, *Wildlife Strike Database*
<http://wildlife-mitigation.tc.faa.gov/wildlife/database.aspx>, Accessed August, 2012

Prepared by: Harris Miller Miller & Hanson Inc., September 2012

4.3.6 Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks – Environmental Justice Sub-Category

FAA Order 1050.1E, Appendix A, paragraph 16.2b states, “Environmental health risks and safety risks include risks to health or to safety that are attributable to products or substances that a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products they might use or be exposed to.” Paragraph 16.2c states, “The principal social impacts to be considered are those associated with relocation or other community disruption, transportation, planned development, and

⁴⁶ US Department of Transportation, Federal Aviation Administration, Wildlife Strike Database <http://wildlife-mitigation.tc.faa.gov/wildlife/database.aspx>

employment.” As indicated in Section 4.2, the Proposed Action does not include land acquisition or ground disturbing activities. In addition, the Proposed Action would not result in an increase in operations that would result in greater emissions that could potentially exacerbate health issues such as asthma in children. This section is limited to a discussion of Environmental Justice as it would pertain to potential aircraft over flight and resultant noise impacts within the airspace of the GSA.

Environmental justice analysis considers the potential of the proposed project alternatives to cause disproportionate and adverse effects on low-income or minority populations. The analysis of environmental justice impacts and associated mitigation ensures that no low income or minority population bears a disproportionate burden of effects resulting from the implementation of the preferred alternative.

To help describe environmental justice, this EA relies on the following definition from the U.S. EPA Office of Environmental Justice:

“The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies. Meaningful involvement means that:

- (1) people have an opportunity to participate in decisions about activities that may affect their environment and/or health;
- (2) the public's contribution can influence the regulatory agency's decision;
- (3) their concerns will be considered in the decision making process; and,
- (4) the decision-makers seek out and facilitate the involvement of those potentially affected.”⁴⁷

The socioeconomic and racial characteristics of the population within the GSA are based on data from the 2010 U.S. Census. This data was provided for geographical units called census tracts which include over 500 types of demographic information including number of households, number of inhabitants, and percentage of households below the federal poverty level. Census tracts with no populations were not included in the analysis. Because some census tracts were only partially located within the GSA, only a portion of the population based on the amount of area within the GSA was included. This methodology was used because census tracts are composed of census blocks, which are used by the NIRS noise model to calculate noise impact at the centroid, or geometric center of the block.

Minority and low-income populations were identified using Geographic Information System (GIS) based on information for each census tract within the GSA. For the purposes of this

⁴⁷ U.S. Environmental Protection Agency, Environmental Justice: Basic Information, (<http://www.epa.gov/compliance/environmentaljustice/index.html>, accessed August 2012.)

environmental justice analysis, minority population census tracts and low-income population census tracts were defined and identified as follows:

- A minority census tract is defined as a tract having a minority population percentage greater than the average minority population percentage of the GSA. Based on the 2010 census data, the average percentage of minority population residing in the GSA was 43 percent. Therefore, every census tract with a percentage of minority population greater than 43 percent was identified as a census tract of environmental justice concern. Exhibit 4-7 depicts those areas exceeding the average minority population percentage within the GSA
- A low-income population census tract is defined as a tract having a greater percentage of low-income population than the average percentage of low-income population residing in the GSA. Based on the 2010 Poverty Guidelines identified by the Department of Health and Human Services (HHS), the poverty threshold for a household of three persons was set at \$18,310 for the 48 contiguous states, and therefore is applicable to the GSA. For the purposes of identifying low-income population census tracts, the HHS threshold of \$18,310 was used. Based on the 2010 data, the average percentage of low-income population residing in the GSA was 15.1 percent. Therefore, every census tract with a percentage of low-income population greater than 15.1 percent was identified as a census tract of environmental justice concern. Exhibit 4-8 depicts the census tracts with above average populations of low-income households within the GSA.

Census tracts of environmental justice concern are defined as those tracts in which the percentage of minority population and/or the percentage of low-income population are higher than their respective averages of the GSA. The combined low income households and minority population data is represented in **Exhibit 4-9** as areas of environmental justice concern. **Table 4-8** shows the 2010 census data for total population, minority population, and low income population for the GSA.

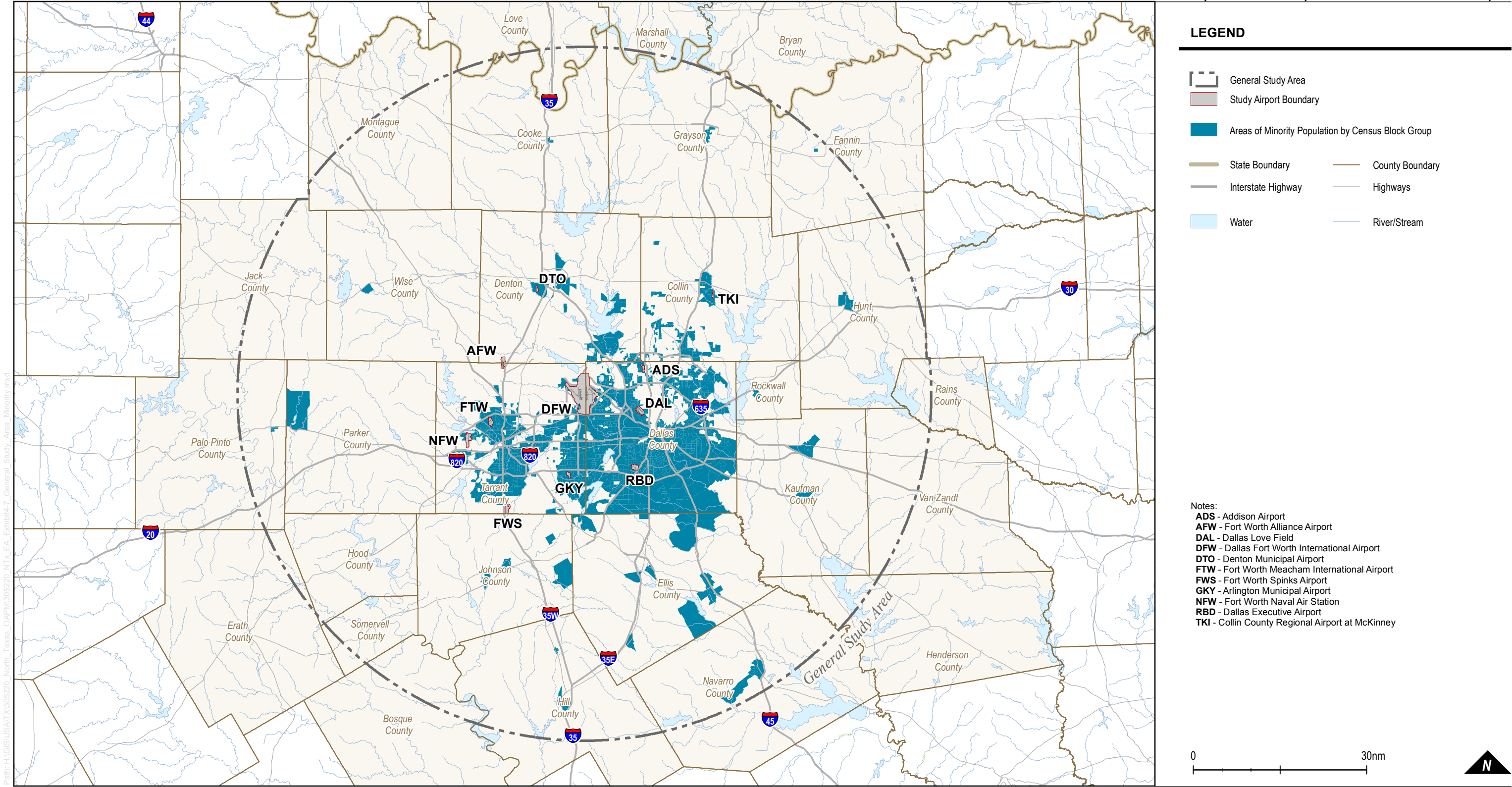
Table 4-8 Selected Populations in the General Study Area

Minority Population	TOTAL		TEXAS		OKLAHOMA	
	Population	%	Population	%	Population	%
Total Population	6,805,343	100.0%	6,793,841	100.0%	11,502	100.0%
Hispanic	1,810,818	26.6%	1,809,936	26.6%	882	7.7%
Black or African American	960,182	14.1%	960,100	14.1%	82	0.7%
American Indian and Alaska Native	29,057	0.4%	28,079	0.4%	978	8.5%
Asian American	339,908	5.0%	339,885	5.0%	23	0.2%
Native Hawaiian and Other Pacific Islander	5,917	0.1%	5,917	0.1%	0	0.0%
Other or Two or More Races	114,835	1.7%	114,306	1.7%	529	4.6%
Total Minority Population	3,260,717	47.9%	3,258,223	48.0%	2,494	21.7%

Low-Income Households	TOTAL		TEXAS		OKLAHOMA	
	Households	%	Households	%	Households	%
Total Number of Households	2,369,868	100.0%	2,365,664	100.0%	4,204	100.0%
Number of Households with Annual Income Below \$20,000	357,187	15.1%	356,357	15.0%	830	19.7%

Source: US Census Bureau PL 94-171 Census Tracts – 2010; US Census Bureau 2010 Census Table SF-1 (Population Counts); and, US Census Bureau American Community Survey Selected Economic Characteristics, 2010

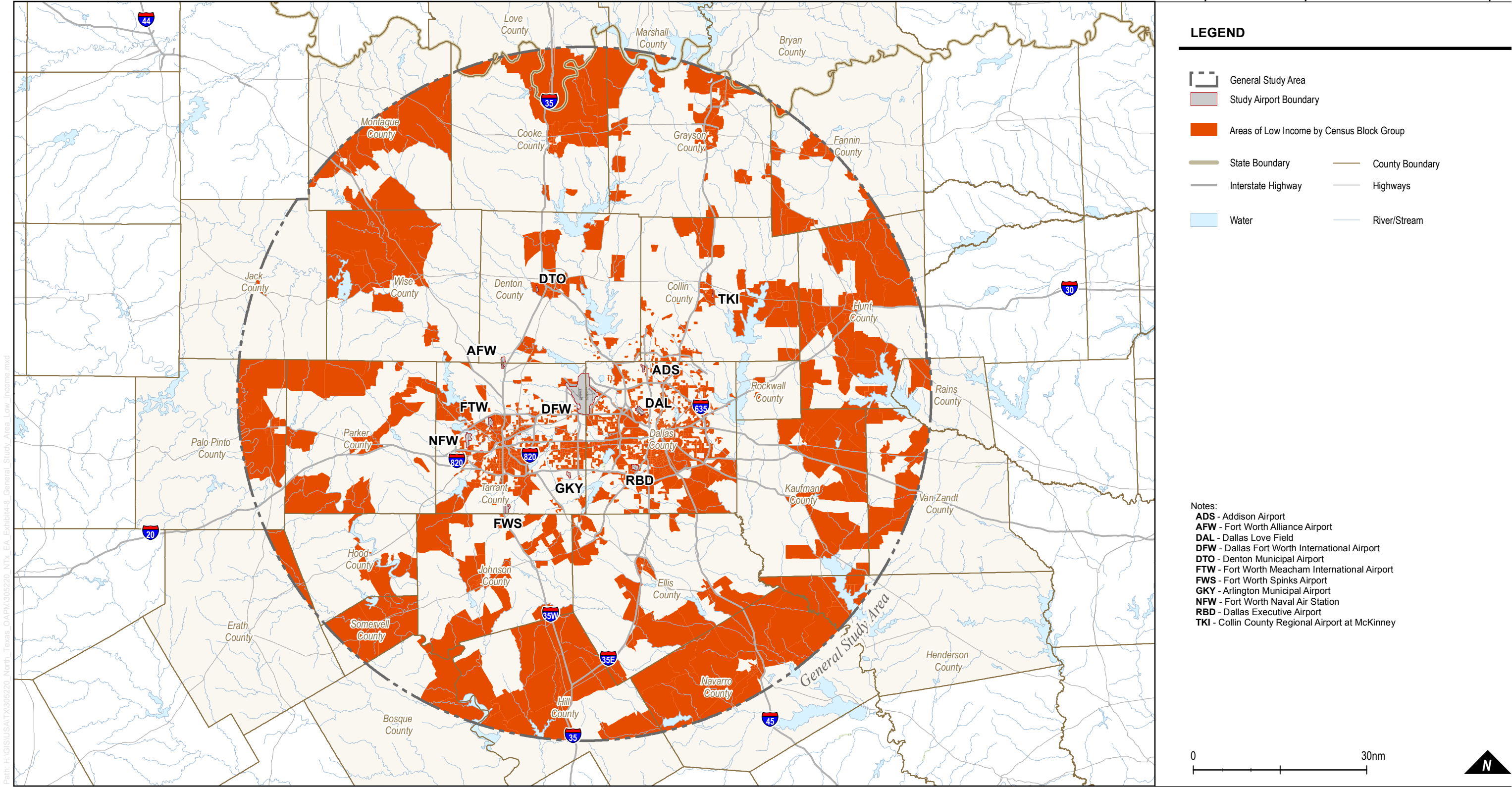
Prepared by: Harris Miller Miller & Hanson Inc., September 2011



Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; United States Census (Census Block Groups), September 27, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-7

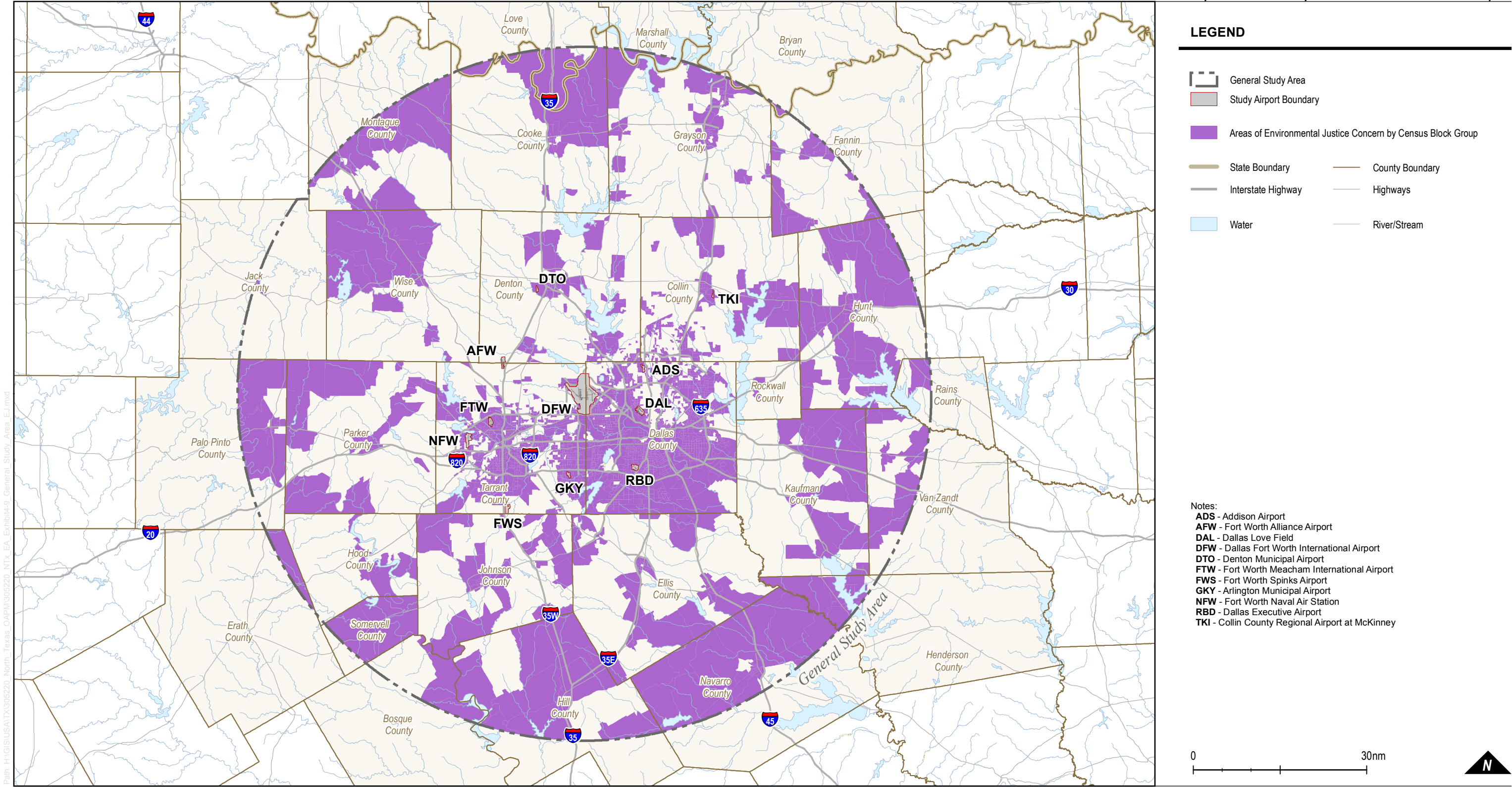
Minority Population within
the General Study Area



Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; United States Census (Census Block Groups), September 27, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-8

Low Income within the General Study Area



Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; United States Census (Census Block Groups), September 27, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-9

Areas of Environmental Justice Concern
within the General Study Area

4.3.7 Energy Supply (Aircraft Fuel)

This section describes fuel consumption by IFR aircraft arriving at and departing from the Study Airports. Using the NIRS model, aircraft fuel burn was calculated to estimate aircraft fuel consumption associated with air traffic flows under 2011 existing conditions. NIRS calculates fuel burn using the same input used for calculating noise (See Section 4.3.1.1 for a discussion of NIRS model inputs.) Based on the NIRS calculation, on an annual average day basis, approximately 2,953,757 kilograms (or 2,954, metric tons) of fuel were burned by IFR aircraft arriving at and departing from the study airports.

4.3.8 Air Quality

This section describes the air quality conditions within the GSA. In the United States, air quality is generally monitored and managed at the county or regional levels. The U.S. EPA, pursuant to mandates of the Federal-Clean Air Act Amendments (CAAA) of 1977, as amended, has established National Ambient Air Quality Standards (NAAQS) to protect public health, the environment, and the quality of life from the detrimental effects of air pollution. Standards have been established for the following criteria pollutants: carbon monoxide (CO), lead (Pb), oxides of nitrogen (NO_x), ozone (O₃), particulate matter (PM), and sulfur dioxide (SO₂). PM standards have been established for inhalable coarse particles ranging in diameter from 2.5 to 10 micrometers (µm) (PM₁₀) and fine particles less than 2.5 µm (PM_{2.5}) in diameter.

In accordance with the CAAA, counties and some sub-county geographical areas are classified by the U.S. EPA with regard to their compliance with the NAAQS based on air monitoring data compiled by U.S. EPA and local air quality agencies. An area with air quality better than the NAAQS is designated as an attainment area. An area with air quality worse than the NAAQS is designated as a nonattainment area. Nonattainment areas are further classified as extreme, severe, serious, moderate, and marginal by the extent the NAAQS are exceeded. Areas that have been reclassified from nonattainment to attainment are identified as maintenance areas. An area may be designated as unclassifiable when there is a temporary lack of data on which to base its attainment status.

Portions of the GSA have been designated as being in non-attainment for the 1997 and 2008 ozone standard as well as for the 2008 lead standard as shown in **Table 4-9, Exhibit 4-10** and **Exhibit 4-11**. In addition, as shown in **Exhibit 4-12**, part of one county (Collin) has been designated as maintenance for the 1978 lead standard. The remaining counties in the GSA are in attainment of the NAAQSs for all criteria pollutants (i.e., carbon monoxide (CO), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), PM₁₀/PM_{2.5}, lead and ozone). A general description of these two criteria pollutants follows.

- **Ozone (O₃):** Ozone is found in two regions of the Earth's atmosphere – at ground level and in the upper regions of the atmosphere. Both types of ozone have the same chemical composition (O₃). While upper atmospheric ozone protects the earth from the sun's harmful rays, ground level ozone is the main component of smog. Tropospheric, or ground level ozone, is not emitted directly into the air, but is created by chemical reactions between ozone precursors, including oxides of nitrogen (NO_x) and volatile organic compounds (VOCs). Ozone is likely to reach unhealthy levels on hot sunny days in urban environments. Ozone can also be transported long distances by wind. For this reason, even rural areas can experience high ozone levels.

- **Lead:** Lead is a naturally found metal in the environment as well as in manufactured products. Major sources of lead emissions have historically been from fuels in on-road vehicles using leaded gasoline along with industrial sources. EPA's regulatory efforts have dramatically reduced lead emissions from on-road vehicles by 95 percent between 1980 and 1999⁴⁸. Major sources of lead emissions today are from lead smelters, ore and metals processing and piston engine aircraft operating on leaded aviation gasoline (i.e. avgas).

Table 4-9 NAAQS Criteria Pollutants in Non-Attainment or Maintenance in the General Study Area

Ozone Non-Attainment			
State	County	Pollutant	Designated Attainment Status
Texas	Collin	Ozone 8-hour (1997) ¹	Non-attainment
		Ozone 8-hour (2008) ²	Non-attainment
	Dallas	Ozone 8-hour (1997) ¹	Non-attainment
		Ozone 8-hour (2008) ²	Non-attainment
	Denton	Ozone 8-hour (1998) ¹	Non-attainment
		Ozone 8-hour (2008) ²	Non-attainment
	Ellis	Ozone 8-hour (1998) ¹	Non-attainment
		Ozone 8-hour (2008) ²	Non-attainment
	Johnson	Ozone 8-hour (1997) ¹	Non-attainment
		Ozone 8-hour (2008) ²	Non-attainment
	Kaufman	Ozone 8-hour (1998) ¹	Non-attainment
		Ozone 8-hour (2008) ²	Non-attainment
	Parker	Ozone 8-hour (1997) ¹	Non-attainment
		Ozone 8-hour (2008) ²	Non-attainment
	Rockwall	Ozone 8-hour (1997) ¹	Non-attainment
		Ozone 8-hour (2008) ²	Non-attainment
	Tarrant	Ozone 8-hour (1997) ¹	Non-attainment
		Ozone 8-hour (2008) ²	Non-attainment
	Wise	Ozone 8-hour (2008) ²	Non-attainment
Lead Non-Attainment/Maintenance			
State	County	Pollutant	Designated Attainment Status
Texas	Collin	Lead (1978) ³	Maintenance (portion of county)
		Lead (2008) ⁴	Non-attainment (portion of county)

Notes:

1/ Ozone 8-hour (1997) denotes attainment status with the 1997 standard.

2/ Ozone 8-hour (2008) denotes attainment status with the 2008 standard.

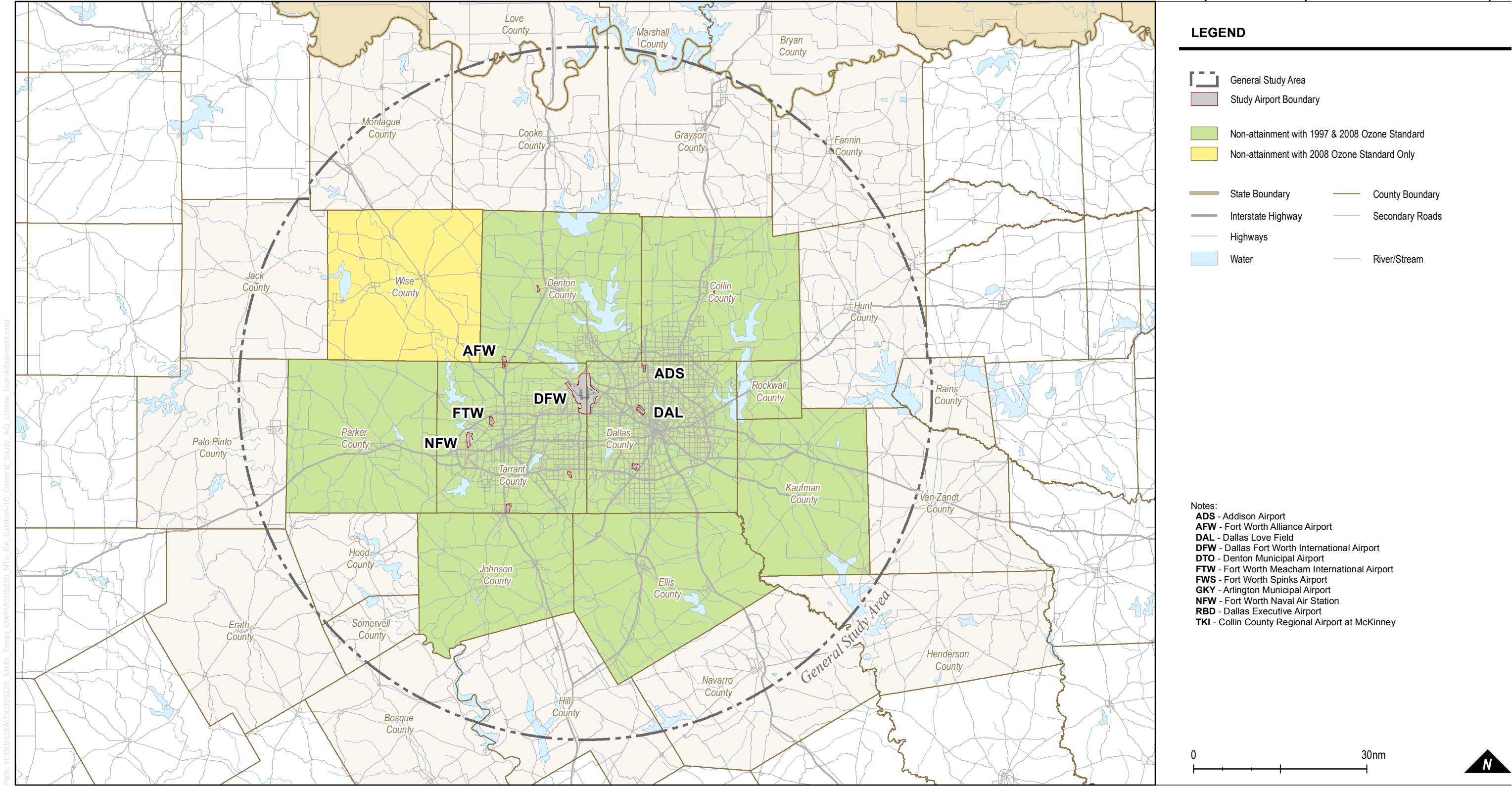
3/ Lead (1978) denotes attainment status with the 1978 standard

4/ Lead (2008) denotes attainment status with the 2008 standard.

Sources: US Environmental Protection Agency Green Book <http://www.epa.gov/oaqps001/greenbk/>.
Accessed August, 2012

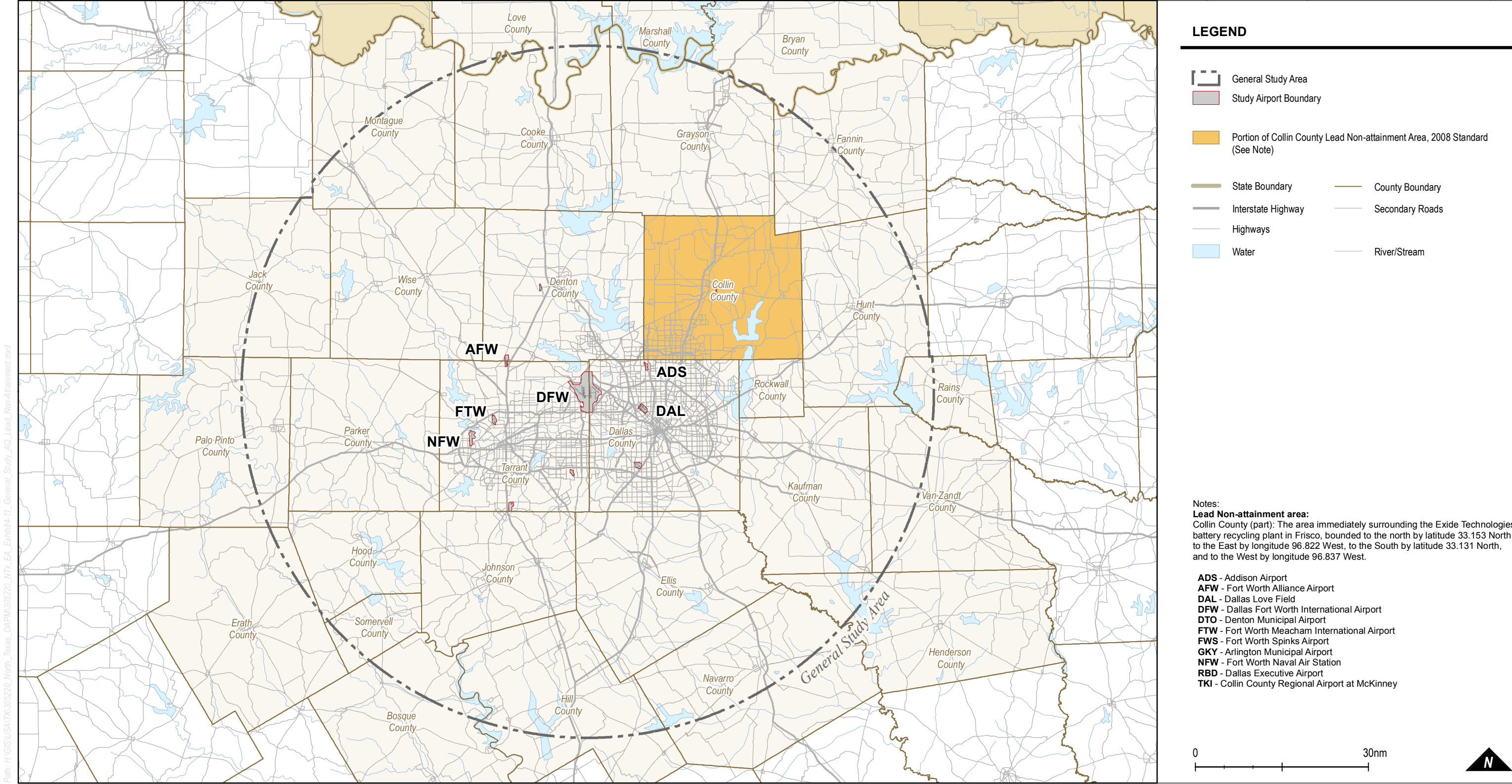
Prepared by: Harris Miller Miller & Hanson Inc., September 2012

⁴⁸ <http://www.epa.gov/airquality/lead/>



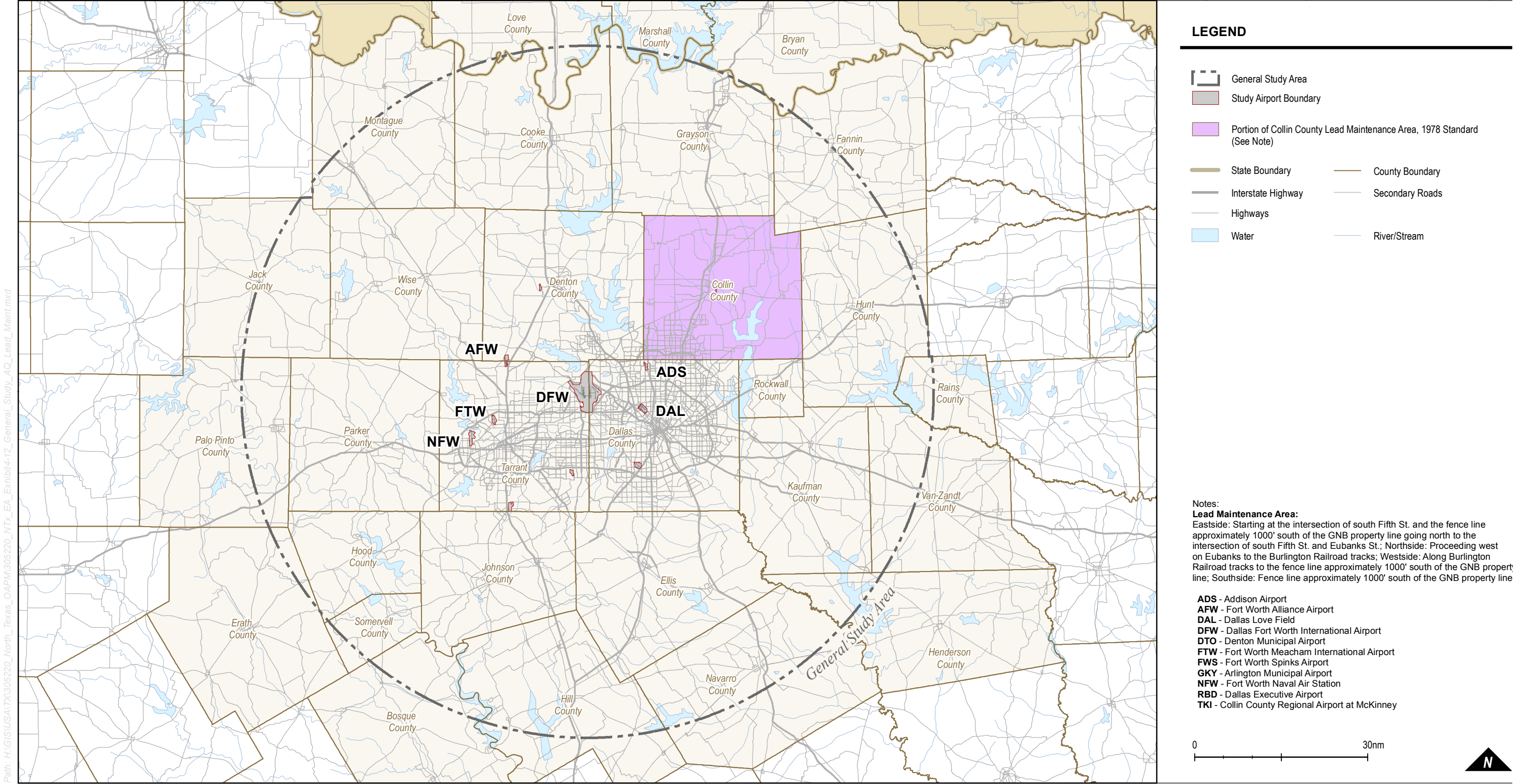
Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-10



Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-11



Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-12

4.3.9 Greenhouse Gasses and Climate Change

Greenhouse gases (GHGs) are naturally occurring and man-made gases that trap heat in the earth's atmosphere. These gases include CO₂, methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). In 2009, based on data provided by the EPA, the General Accounting Office (GAO) reported that domestic aviation contributed approximately three percent of total national carbon dioxide emissions.⁴⁹ Similarly, in its 2010 Environmental Report, the International Civil Aviation Organization (ICAO) estimated that aviation accounted for approximately three percent of all global CO₂ emissions resulting from human activity.⁵⁰ In October 2010, the CEQ issued the *Federal GHG Accounting and Reporting Guidance* (Guidance) establishing requirements for federal agencies to calculate and report GHG emissions associated with agency operations. The federal guidance also established a single metric for reporting all GHGs in metric tons (MT) of CO₂ equivalent (CO₂e) or MTCO₂e.

For purposes of this EA, total MTCO₂e were calculated using the amount of fuel burned by IFR aircraft arriving and departing from the Study Airports in the GSA as estimated by the NIRS model. Fuel burn calculations are discussed in Section 4.3.7, *Energy Supply*. The calculated fuel burn was used to estimate the total MT of CO₂, reported here as MTCO₂e. **Table 4-10** presents the total estimated MTCO₂e along with estimates of all national and global emissions of MTCO₂e.

Table 4-10 GHG Summary for General Study Area

	<u>Fuel Burn Impact</u>	<u>Fuel (kg)</u>	<u>MT CO₂e</u>
	Existing Conditions	2,953,757	9,319
Sources:	Harris Miller Miller & Hanson Inc., August 2013; U.S. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011 (EPA 430-R-13-001), April 12, 2013; United Nations Environment Programme, The Emissions Gap Report 2012, November 2012.		
Prepared by:	Harris Miller Miller & Hanson Inc., August 2013		

4.3.10 Light Emissions and Visual Impacts

The GSA includes approximately 14,978 square statute miles of developed and undeveloped areas in a GSA consisting of portions of Texas and Oklahoma, including major urbanized regions. A large number of aircraft operations currently occur and numerous aircraft are visible within the GSA airspace, flying at various altitudes. Aircraft operations consist of aircraft arrivals, departures, and overflights. According to Federal Aviation Regulation (FAR), Section 91.209, all aircraft are required to operate with position lights during the period between sunset and sunrise. These position lights are intended for the safe movement of aircraft and do not produce significant light emissions; however, these lights are often visible from the ground.

⁴⁹United States Congress, U.S. Government Accountability Office, Aviation and Climate Change. GAO Report to Congressional Committees, (2009). (<http://www.gao.gov/new.items/d09554.pdf>).

⁵⁰ Alan Melrose, "European ATM and Climate Adaptation: A Scoping Study," in ICAO Environmental Report. (2010).